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(71) Applicant : **TDK CORPORATION**
13-1, Nihonbashi 1-chome
Chuo-ku Tokyo (JP)

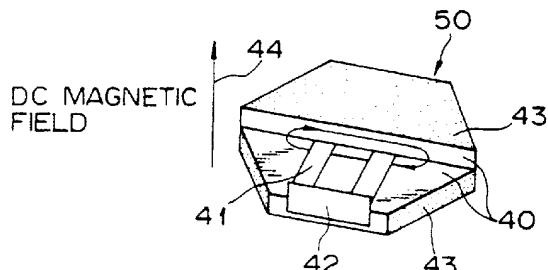
(72) Inventor : **Miura, Taro**
24-10, Miyamae 4-chome,
Suginami-ku
Tokyo (JP)
Inventor : **Kobayashi, Makoto**
55-11, Chiyoda 5-chome
Yotsukaido-shi, Chiba (JP)
Inventor : **Suzuki, Kazuaki**
3-11, Misatodai 3-chome
Narita-shi, Chiba (JP)
Inventor : **Fujii, Tadao**
1537-120, Kami-kohya
Yachiyo-shi, Chiba (JP)

(74) Representative : **Dubois-Chabert, Guy**
Société de Protection des Inventions
25, rue de Ponthieu
F-75008 Paris (FR)

(54) Multi-layer microwave circulator.

(57) A multi-layer circulator includes a circulator element (50) with inner conductors (41) having a predetermined pattern and a insulating ferromagnetic material body (40) closely surrounding the inner conductors. The insulating ferromagnetic material body is formed in a single continuous layer by firing a plurality of ferromagnetic material layers. The circulator also includes a plurality of terminal electrodes (76) formed on side surfaces of the circulator element and electrically connected to one ends of the inner conductors, a plurality of circuit elements (51a, 51b, 51c) electrically connected to the terminal electrodes, and exciting permanent magnets (52, 53) for applying a dc magnetic field to the circulator element.

Fig. 4





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EUROPEAN SEARCH REPORT

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EP 94 40 0682

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	PATENT ABSTRACTS OF JAPAN vol. 15 no. 183 (E-1065) ,10 May 1991 & JP-A-03 044011 (MURATA MFG CO LTD) 25 February 1991, * abstract *---	1,16,26	H01P1/387 H01P11/00
A	DE-A-29 17 124 (LICENTIA PATENT-VERWALTUNGS-GMBH) * page 5, line 11 - page 6, line 4; figures 1,2 *---	1,7-9, 16, 23-26, 33-35	
A	IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES, vol. 15, no. 12, December 1967 NEW YORK US, pages 748-750, B. HERSHENOV 'Microstrip junction circulator for microwave integrated circuits' * page 749, right column, line 1 - page 750, left column, line 57 *---	1,16,26	
P,X	GB-A-2 266 412 (MURATA MFG CO LTD) * page 37, line 1 - page 38, line 17; figures 21-23 *---	1,7-9	
P,X	GB-A-2 269 942 (MURATA MFG CO LTD) * the whole document *-----	1,7-9	
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	10 August 1995	Den Otter, A	
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	